

DISTRIBUTED MODEL OF “YASKAWA” DC DRIVES

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by

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Abstract

Developing a faithful and interactive model for the DC Hoist Drive System of the Container Cranes at Port of Colombo is the base of this research work.

Hoisting a maximum load of 45.5 ton, including the container weight under the spreader of the container crane at 45 meters per minute is the base requirement of the system. But lighter loads can be hoisted at higher speeds than the base speed utilizing the rated capacity of the system.

A closed loop DC drive system, being arranged in Ward-Leonard Speed Control method is providing acceleration torque to all loads to speed up on a fixed ramp increasing the motor armature voltage. While the load is on acceleration the system calculates the load torque and sets the load dependent final speed limit beyond the base speed if possible. Motor field has to be weakened to raise the rotor speed beyond the base speed.

A model is developed to simulate complete closed loop system as in actual operations using MATLAB-SIMULINK software with all available data. The model output matches almost perfectly with steady state portions of the actual operational cycle but deviates from the actual measurements at transient states.

The Model is then enhanced to behave as actual operational cycle and to reflect output as much as closer to the field measurements modifying the dynamic function blocks. For some blocks it only needed adding delay components but load torque and motor excitation control function blocks have to be modified with more complex systems.